

We claim:

1. A medical device, comprising: a synthetic, bioabsorbable, biocompatible polymeric wax comprising the reaction product of a polybasic acid or derivative thereof, a fatty acid; and a polyol, said polymeric wax having a melting point less than about 70°C, as determined by differential scanning calorimetry.
2. The medical device of claim 1 wherein said polymeric wax comprises the reaction product of said polybasic acid or derivative thereof and a monoglyceride, said monoglyceride comprising the reaction product of said fatty acid and said polyol.
3. The medical device of claim 2 wherein said polybasic acid or derivative thereof is selected from the group consisting of succinic acid, succinic anhydride, malic acid, tartaric acid, citric acid, diglycolic acid, diglycolic anhydride, glutaric acid, glutaric anhydride, adipic acid, pimelic acid, suberic acid, sebamic acid, fumaric acid, maleic acid, maleic anhydride, mixed anhydrides, esters, activated esters and acid halides.
4. The medical device of claim 2 wherein said monoglyceride is selected from the group consisting of monostearoyl glycerol, monopalmitoyl glycerol, monomyristoyl glycerol, monocaproyl glycerol,

monodecanoyl glycerol, monolauroyl glycerol, monolinoleoyl glycerol and monooleoyl glycerol.

5. The medical device of claim 4 wherein said polybasic acid derivative is succinic anhydride.

6. The medical device of claim 4 wherein said polybasic acid is succinic acid.

7. The medical device of claim 1 wherein said polymeric wax has a number average molecular weight between about 1,000 g/mole and about 100,000 g/mole, as measured by gel permeation chromatography using polystyrene standards.

8. The medical device of claim 1 wherein said polymeric wax is branched.

9. The medical device of claim 1 wherein said polymeric wax comprises a copolymer.

10. The medical device of claim 9 wherein said polymeric wax copolymer comprises the reaction product of said fatty acid, said polyol, and at least two of said polybasic acids or derivatives thereof selected from the group consisting of succinic acid, succinic anhydride, malic acid, tartaric acid, citric acid, diglycolic acid and diglycolic anhydride.

20 11. The medical device of claim 9 wherein said polymeric wax copolymer comprises the reaction product

5 of said polybasic acid or derivative thereof, and at least two monoglycerides selected from the group consisting of monostearoyl glycerol, monopalmitoyl glycerol, monomyrisitoyl glycerol, monocaproyl glycerol, monodecanooyl glycerol, monolauroyl glycerol, monolinoleoyl glycerol and monooleoyl glycerol.

12. The medical device of claim 9 wherein said wax copolymer comprises the reaction product of said polybasic acid or derivative thereof, a monoglyceride selected from the group consisting of monostearoyl glycerol, monopalmitoyl glycerol, monomyrisitoyl glycerol, monocaproyl glycerol, monodecanooyl glycerol, monolauroyl glycerol, monolinoleoyl glycerol and monooleoyl glycerol, and at least one additional polyol selected from the group consisting of ethylene glycol, 1,2-propylene glycol, 1,3-propanediol, bis-2-hydroxyethyl ether, 1,4-butanediol, 1,5-pentanediol, 1,6-hexanediol, 1,8-octanediol, 1,10-decanediol, 1, 12-dodecanediol, other diols, linear poly(ethylene glycol), branched poly(ethylene glycol), linear poly(propylene glycol), branched poly(propylene glycol), linear poly(ethylene-co-propylene glycol)s and branched poly(ethylene-co-propylene glycol)s.

20 25 13. The medical device of claim 1 further comprising an effective amount of a bioactive agent.

14. The medical device of claim 1 further comprising an aliphatic polyester prepared from monomers selected from

the group consisting of glycolide, L-lactide, D-lactide, meso-lactide, rac-lactide, ϵ -caprolactone, trimethylene carbonate, p-dioxanone, 1,4-dioxanone, 1,4-dioxepan-2-one, 1,5-dioxepan-2-one and substituted derivatives thereof.

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15. The medical device of claim 1 comprising a coating of said polymeric wax.

16. The medical device of claim 15 further comprising an aliphatic polyester prepared from the group of monomers consisting of glycolide, L-lactide, D-lactide, meso-lactide, rac-lactide, ϵ -caprolactone, trimethylene carbonate, p-dioxanone, 1,4-dioxanone, 1,4-dioxepan-2-one, 1,5-dioxepan-2-one and substituted derivatives thereof.

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17. The medical device of claim 1 comprising a bone replacement material comprising said polymeric wax and an inorganic filler.

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18. The medical device of claim 17 wherein said polymeric wax is the reaction product of succinic anhydride and a monoglyceride selected from the group consisting of monostearoyl glycerol, monopalmitoyl glycerol, monomyrisitoyl glycerol, monocaproyl glycerol, monodecanoyl glycerol, monolauroyl glycerol, monolinoleoyl glycerol and monooleoyl glycerol.

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19. The medical device of claim 17 wherein said inorganic filler is selected from the group consisting of alpha-tricalcium phosphate, beta-tricalcium phosphate, calcium carbonate, barium carbonate, calcium sulfate, barium sulfate and hydroxyapatite.

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20. The medical device of claim 17 wherein said inorganic filler comprises a polymorph of calcium phosphate.

21. The medical device of claim 17 wherein said inorganic filler is hydroxyapatite.

22. The medical device of claim 17 further comprising a
20 an effective amount of a bioactive agent.

23. The medical device of claim 22 wherein said
25 bioactive agent is a growth factor.

24. The medical device of claim 17 wherein said bone
replacement material comprises a biologically derived
20 substance selected from the group consisting of
demineralized bone, platelet rich plasma, bone marrow
aspirate and bone fragments.

25. The medical device of claim 24 wherein said
polymeric wax is the reaction product of succinic
anhydride and a monoglyceride selected from the group
25 consisting of monostearoyl glycerol, monopalmitoyl
glycerol, monomyristoyl glycerol, monocaproyl glycerol,

monodecanoyl glycerol, monolauroyl glycerol, monolinoleoyl glycerol and monooleoyl glycerol.

26. The medical device of claim 24 wherein said inorganic filler is selected from the group consisting of alpha-tricalcium phosphate, beta-tricalcium phosphate, calcium carbonate, barium carbonate, calcium sulfate, barium sulfate and hydroxyapatite.

27. The medical device of claim 24 wherein said bone replacement material further comprises an effective amount of a bioactive agent.

28. The medical device of claim 27 wherein the bioactive agent is a growth factor.

29. The medical device of claim 17 further comprising an aliphatic polyester prepared from the group of monomers consisting of glycolide, glycolide, L-lactide, D-lactide, meso-lactide, rac-lactide, ϵ -caprolactone, trimethylene carbonate, p-dioxanone, 1,4-dioxanone, 1,4-dioxepan-2-one, 1,5-dioxepan-2-one and substituted derivatives thereof.

30. The medical device of claim 22 further comprising an aliphatic polyester prepared from the group of monomers consisting of glycolide, L-lactide, D-lactide, meso-lactide, rac-lactide, ϵ -caprolactone, trimethylene carbonate, p-dioxanone, 1,4-dioxanone, 1,4-dioxepan-2-

one, 1,5-dioxepan-2-one and substituted derivatives thereof.

31. The medical device of claim 1 selected from the group consisting of sutures, stents, vascular grafts, stent-graft combinations, meshes, tissue engineering scaffolds, pins, clips, staples, films, sheets, foams, anchors, screws and plates.

32. A composition, comprising: an effective amount of a bioactive agent, and a wax comprising the reaction product of a polybasic acid or derivative thereof, a fatty acid and a polyol, said wax having a melting point less than about 70°C, as determined by differential scanning calorimetry.

33. The composition of claim 32 wherein said polymeric wax comprises the reaction product of said polybasic acid or derivative thereof and a monoglyceride, said monoglyceride comprising the reaction product of said fatty acid and said polyol.

34. The composition of claim 32 wherein said polybasic acid or derivative thereof is selected from the group consisting of succinic acid, succinic anhydride, malic acid, tartaric acid, citric acid, diglycolic acid, diglycolic anhydride, glutaric acid, glutaric anhydride, adipic acid, pimelic acid, suberic acid, sebacic acid and derivatives thereof.

35. The composition of claim 33 wherein said monoglyceride is selected from the group consisting of monostearoyl glycerol, monopalmitoyl glycerol, monomyrisitoyl glycerol, monocaproyl glycerol, monodecanoyl, monolauroyl glycerol, monolinoleoyl glycerol and monooleoyl glycerol.

36. The composition of claim 35 wherein said polybasic acid derivative is succinic anhydride.

37. The composition of claim 35 wherein said polybasic acid is succinic acid.

38. The composition of claim 32 wherein said polymeric wax has a number average molecular weight between about 1,000 g/mole and about 100,000 g/mole, as measured by gel permeation chromatography using polystyrene standards.

39. The composition of claim 32 wherein said polymeric wax is branched.

40. The composition of claim 32 wherein said polymeric wax comprises a copolymer.

41. The composition of claim 40 wherein said polymeric wax copolymer comprises the reaction product of said fatty acid, said polyol, and at least two of said polybasic acids or derivatives thereof selected from the group consisting of succinic acid, succinic anhydride,

malic acid, tartaric acid, citric acid, diglycolic acid and diglycolic anhydride.

42. The composition of claim 40 wherein said polymeric wax copolymer comprises the reaction product of said polybasic acid or derivative thereof, and at least two monoglycerides selected from the group consisting of monostearoyl glycerol, monopalmitoyl glycerol, monomyrisitoyl glycerol, monocaproyl glycerol, monodecanoyl glycerol, monolauroyl glycerol, monolinoleoyl glycerol and monooleoyl glycerol.

43. The composition of claim 40 wherein said polymeric wax copolymer comprises the reaction product of said polybasic acid or derivative thereof, a monoglyceride selected from the group consisting of monostearoyl glycerol, monopalmitoyl glycerol, monomyrisitoyl glycerol, monocaproyl glycerol, monodecanoyl glycerol, monolauroyl glycerol, monolinoleoyl glycerol and monooleoyl glycerol, and at least one additional polyol selected from the group consisting of ethylene glycol, 1,2-propylene glycol, 1,3-propanediol, bis-2-hydroxyethyl ether, 1,4-butanediol, 1,5-pentanediol, 1,6-hexanediol, 1,8-octanediol, 1,10-decanediol, 1, 12-dodecanediol, other diols, linear poly(ethylene glycol), branched poly(ethylene glycol), linear poly(propylene glycol), branched poly(propylene glycol), linear poly(ethylene-co-propylene glycol)s and branched poly(ethylene-co-propylene glycol)s.

44. The composition of claim 32 wherein said bioactive agent is selected from the group consisting of antiinfectives, analgesics, anorexics, antihelmintics, antiarthritics, antiasthmatics, anticonvulsants, antidepressants, antidiuretics, antidiarrheals, antihistamines, antiinflammatory agents, antimigraine preparations, antinauseants, antineoplastics, antiparkinsonism drugs, antipruritics, antipsychotics, antipyretics, antispasmodics, anticholinergics, sympathomimetics, xanthine derivatives, calcium channel blockers, beta-blockers, antiarrhythmics, antihypertensives, diuretics, vasodilators, central nervous system stimulants, decongestants, hormones, steroids, hypnotics, immunosuppressives, muscle relaxants, parasympatholytics, psychostimulants, sedatives, tranquilizers, naturally derived or genetically engineered proteins, polysaccharides, glycoproteins, or lipoproteins, oligonucleotides, antibodies, antigens, cholinergics, chemotherapeutics, hemostatics, clot dissolving agents, radioactive agents and cystostatics.

45. The composition of claim 44 wherein said bioactive agent is risperidone.

46. The composition of claim 44 wherein said bioactive agent is erythropoietin.

47. The composition of claim 32 wherein said bioactive agent is selected from the group consisting of

pesticides, insecticides, fungicides, germicides and fertilizers.

48. The composition of claim 32 further comprising an aliphatic polyester prepared from the group of monomers consisting of glycolide, L-lactide, D-lactide, meso-lactide, rac-lactide, ϵ -caprolactone, trimethylene carbonate, p-dioxanone, 1,4-dioxanone, 1,4-dioxepan-2-one, 1,5-dioxepan-2-one and substituted derivatives thereof.

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49. A seed comprising a coating of a synthetic, bioabsorbable, biocompatible polymeric wax comprising the reaction product of a polybasic acid or derivative thereof, a fatty acid, and a polyol, said polymeric wax having a melting point less than about 70°C, as determined by differential scanning calorimetry.

50. The seed of claim 49 wherein said polymeric wax comprises the reaction product of said polybasic acid or derivative thereof, and a monoglyceride, said monoglyceride comprising the reaction product of said fatty acid and said polyol.

51. The seed of claim 50 wherein said monoglyceride is selected from the group consisting of monostearoyl glycerol, monopalmitoyl glycerol, monomyristitoyl glycerol, monocaproyl glycerol, monodecanoyl glycerol,

monolauroyl glycerol, monolinoleoyl glycerol and monooleoyl glycerol.

5 52. The seed of claim 50 wherein said polymeric wax comprises the reaction product of succinic anhydride and said monoglyceride selected from the group consisting of monostearoyl glycerol, monopalmitoyl glycerol, monomyrisitoyl glycerol, monocaproyl glycerol, monodecanoyl glycerol, monolauroyl glycerol, monolinoleoyl glycerol and monooleoyl glycerol.

20 53. The seed of claim 49 further comprising an aliphatic polyester prepared from the group of monomers consisting of glycolide, L-lactide, D-lactide, meso-lactide, rac-lactide, ϵ -caprolactone, trimethylene carbonate, p-dioxanone, 1,4-dioxanone, 1,4-dioxepan-2-one, 1,5-dioxepan-2-one and substituted derivatives thereof.

25 54. The seed of claim 49 wherein said polymeric wax further comprises an effective amount of a bioactive agent selected from the group consisting of pesticides, insecticides, fungicides, germicides and fertilizers.

55. The seed of claim 49 wherein said polymeric wax has a number average molecular weight between about 1,000 g/mole and about 100,000 g/mole, as measured by gel permeation chromatography using polystyrene standards.

56. The device of claim 1 wherein said polymeric wax has a melting point between about 25°C and about 70°C.

57. The composition of claim 32 wherein said polymeric wax has a melting point between about 25°C and about 70°C.

58. The seed of claim 49 wherein said polymeric wax has a melting point between about 25°C and about 70°C.